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Toward New Frontiers: Deploying State-of-the-Art Astronomical X-ray and Gamma-ray Detectors into Interdisciplinary Fields

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Research aimed at addressing profound scientific questions about the universe has driven the development of cutting-edge detectors with exceptional performance, achieved through an unwavering pursuit of sensitivity and resolution. We have successfully applied technologies originally developed for X-ray and gamma-ray space observations-including multipixel superconducting microcalorimeters, large-area CdTe semiconductor imagers, and advanced X-ray astronomical analysis techniques-to interdisciplinary fields such as atomic physics and non-destructive elemental analysis using negative muons. Furthermore, the semiconductor Compton camera, designed to revolutionize MeV gamma-ray observations, has proven remarkably effective for precise polarization measurements of X-rays from highly charged heavy ions and gamma rays from excited states of nuclei.

Beyond applications in physics, we have applied these technologies to cancer research, particularly in nuclear medicine. Key applications include visualizing pharmacokinetics to accurately predict therapeutic efficacy and potential side effects in treatments like alpha-particle radionuclide therapy, as well as facilitating the detection of microcancers.

In this talk, I will highlight examples of collaborative research with interdisciplinary partners that have not only advanced fundamental scientific studies but have also opened new frontiers in applied research, spanning a wide range of fields from elemental analysis to medicine.

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